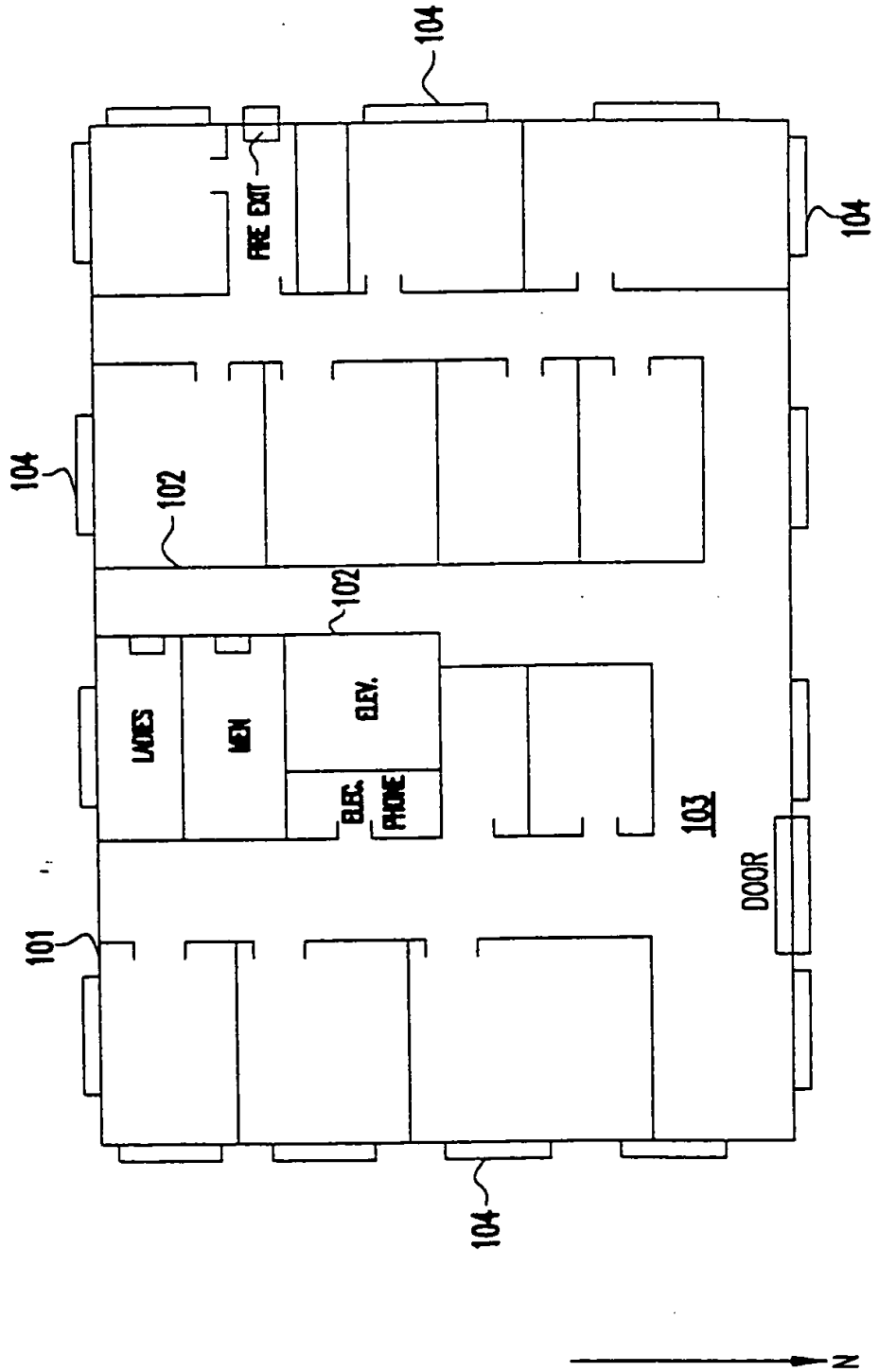
104
FIRE EXIT
104
104
102
102
LADIES
MEN
ELEV.
ELEC.
PHONE
103
DOOR
101
104
N

FIG.1

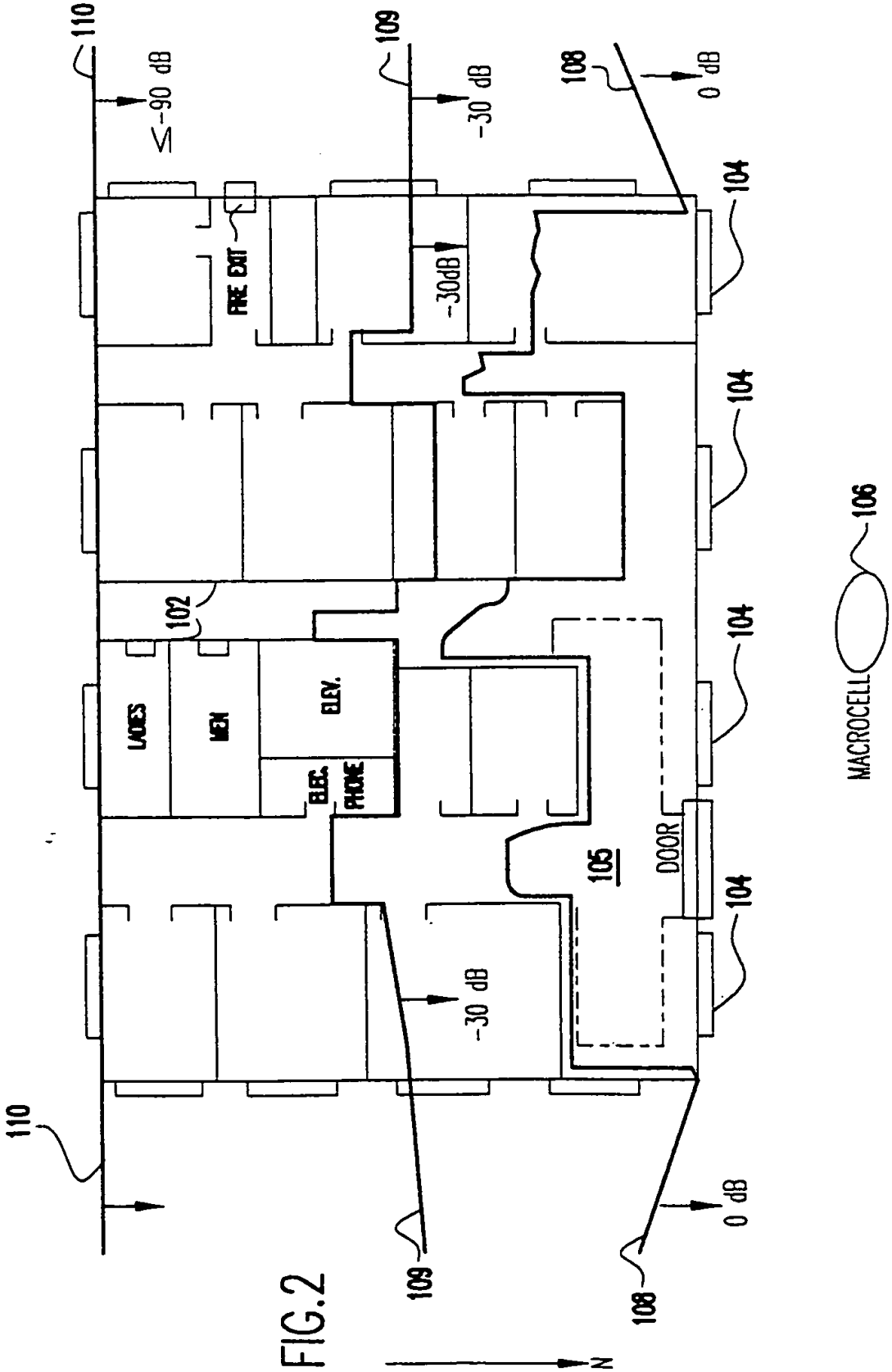
110
≤-90 dB
109
-30 dB
108
0 dB
104
FIRE EXIT
-30dB
104
102
LADIES
MEN
ELEV.
ELEC.
PHONE
104
105
DOOR
104
-30 dB
110
109
108
0 dB
N
MACROCELL
106

FIG.2

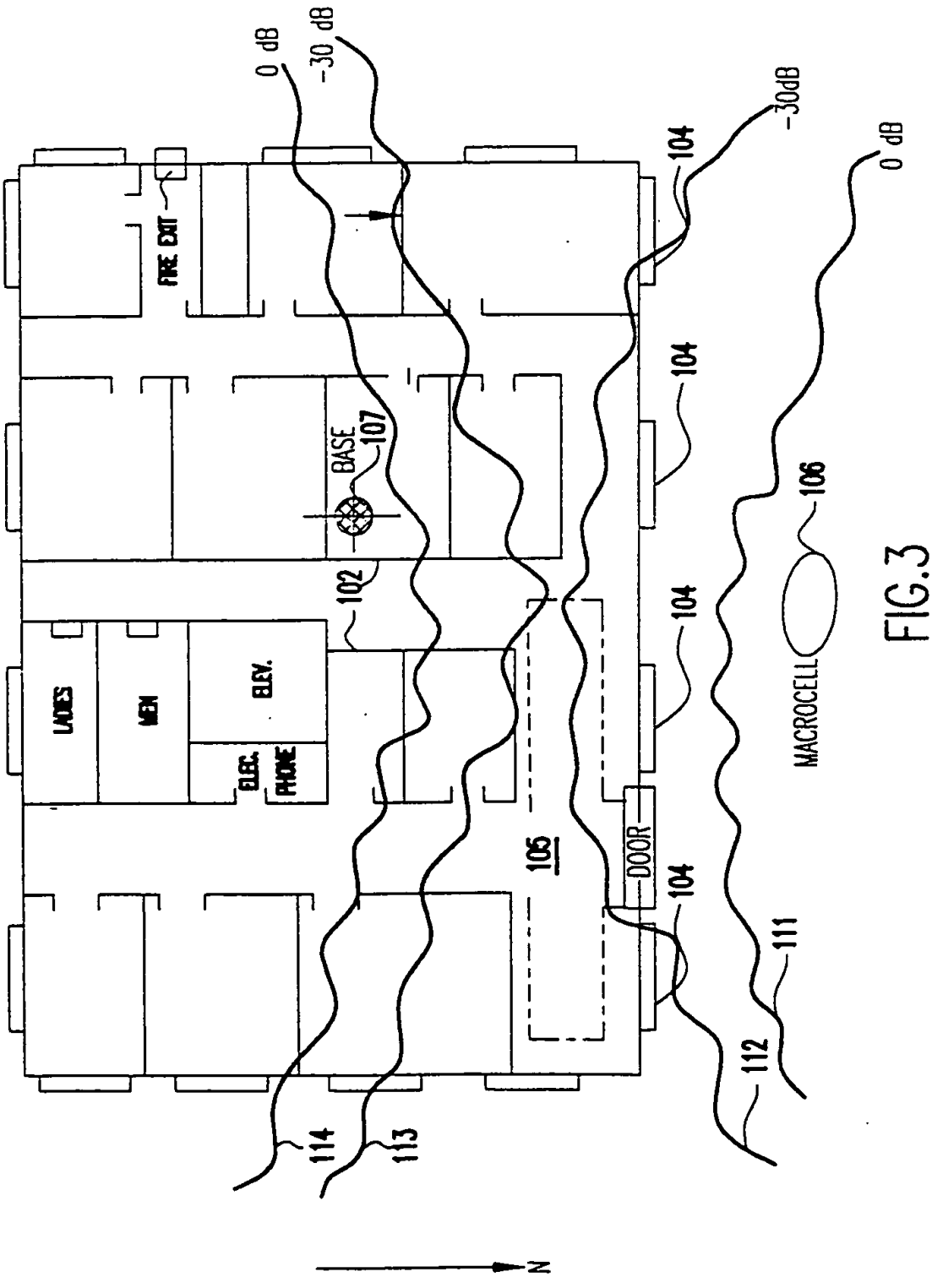
0 dB
-30 dB
FIRE EXIT
BASE
107
102
LADIES
MEN
ELEV.
ELEC.
PHONE
105
DOOR
104
104
104
104
-30dB
0 dB
106
MACROCELL
111
112
114
113
N

FIG.3

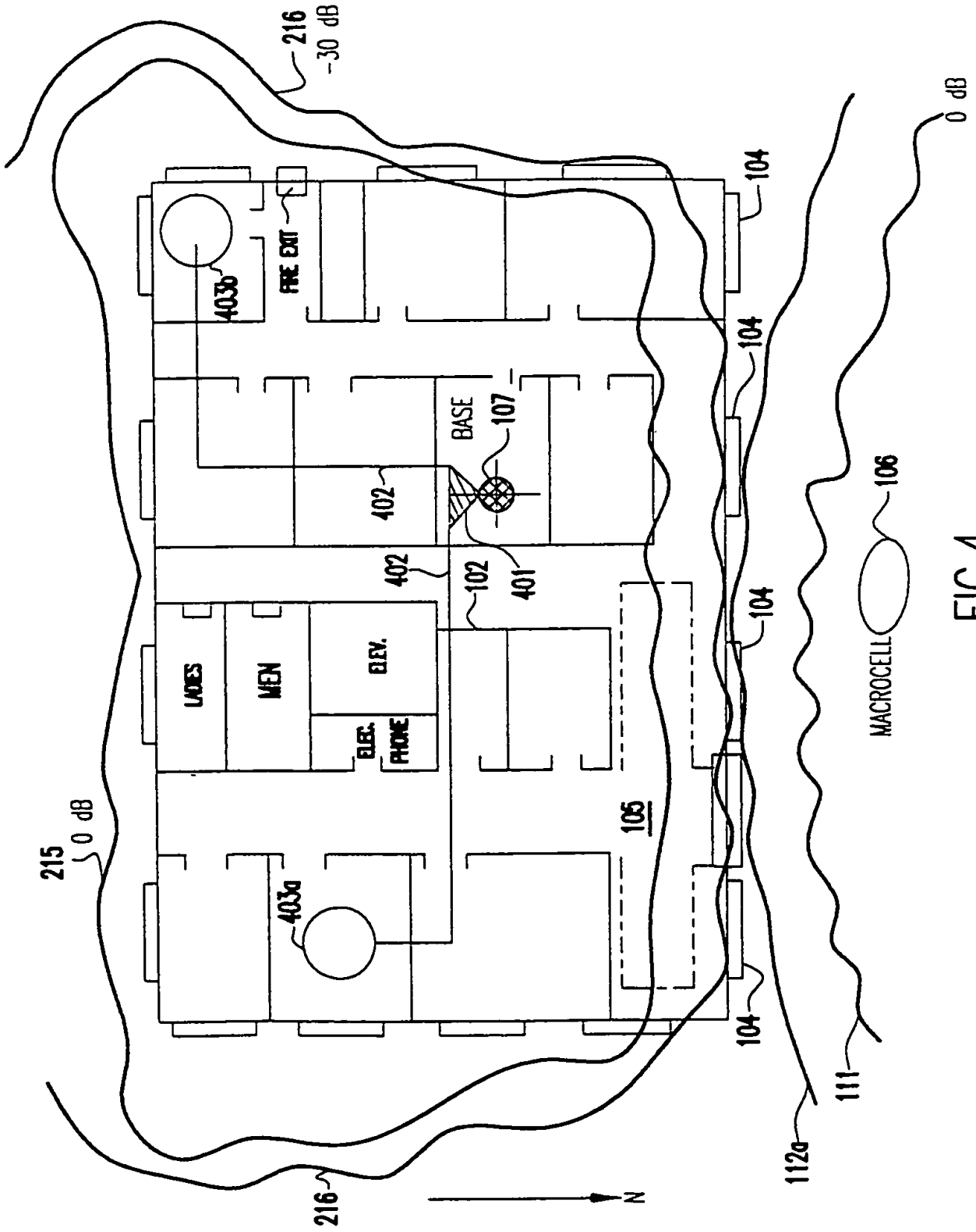
216
-30 dB
FIRE EXIT
403b
104
BASE
107
402
402
102
401
LADIES
MEN
ELEV.
ELEC.
PHONE
105
215
0 dB
403a
216
N
0 dB
106
MACROCELL
111
112a

FIG.4

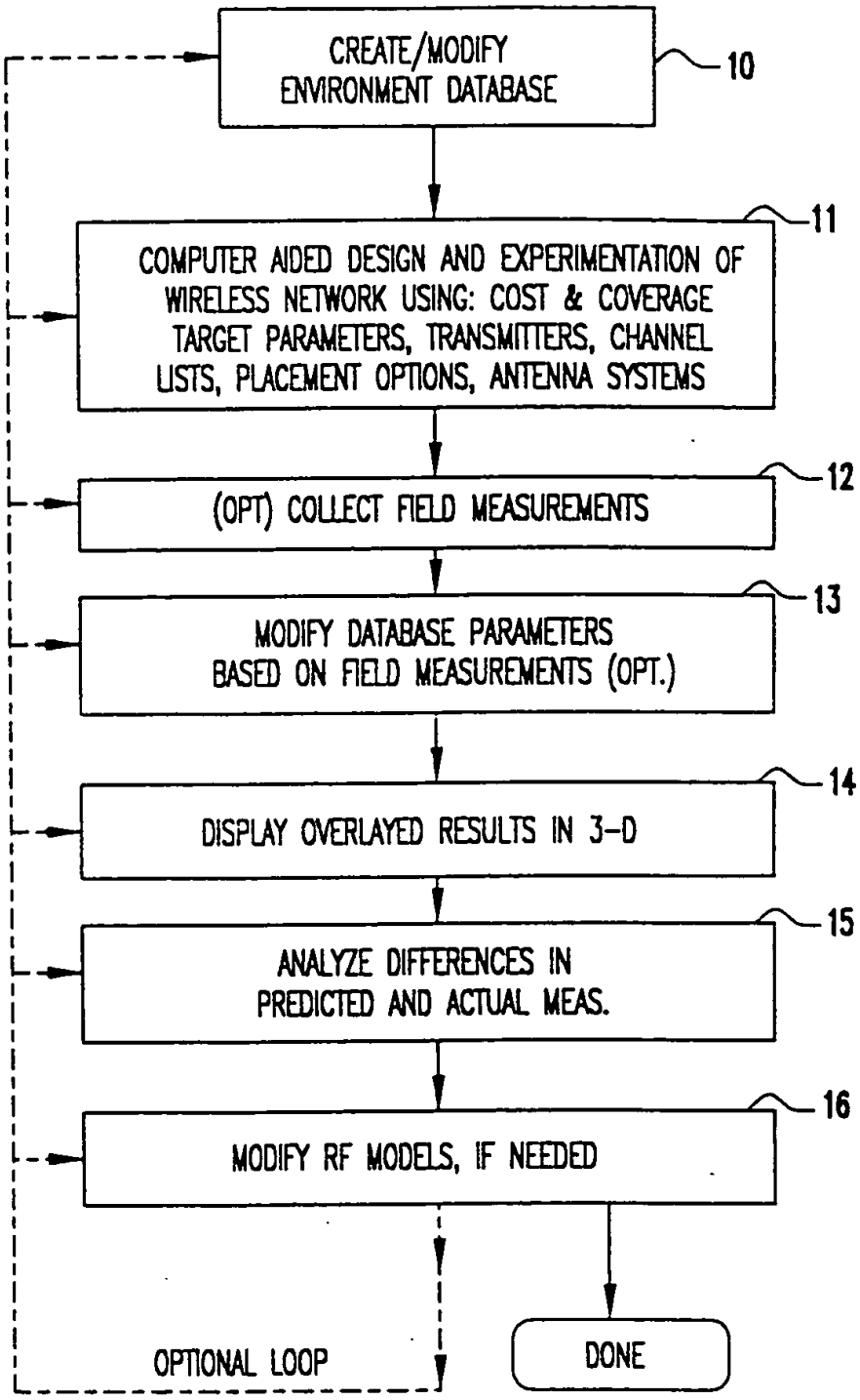
CREATE/MODIFY ENVIRONMENT DATABASE
10
COMPUTER AIDED DESIGN AND EXPERIMENTATION OF WIRELESS NETWORK USING: COST & COVERAGE TARGET PARAMETERS, TRANSMITTERS, CHANNEL LISTS, PLACEMENT OPTIONS, ANTENNA SYSTEMS
11
(OPT) COLLECT FIELD MEASUREMENTS
12
MODIFY DATABASE PARAMETERS BASED ON FIELD MEASUREMENTS (OPT.)
13
DISPLAY OVERLAYED RESULTS IN 3-D
14
ANALYZE DIFFERENCES IN PREDICTED AND ACTUAL MEAS.
15
MODIFY RF MODELS, IF NEEDED
16
OPTIONAL LOOP
DONE

FIG.5

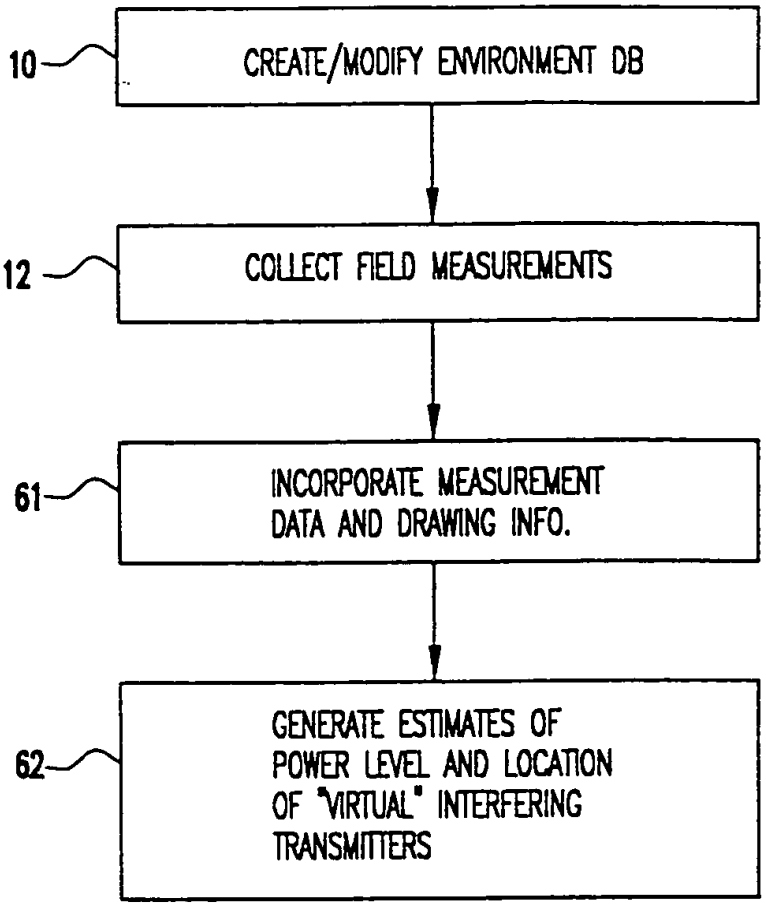
10
CREATE/MODIFY ENVIRONMENT DB
12
COLLECT FIELD MEASUREMENTS
61
INCORPORATE MEASUREMENT DATA AND DRAWING INFO.
62
GENERATE ESTIMATES OF POWER LEVEL AND LOCATION OF "VIRTUAL" INTERFERING TRANSMITTERS

FIG.6

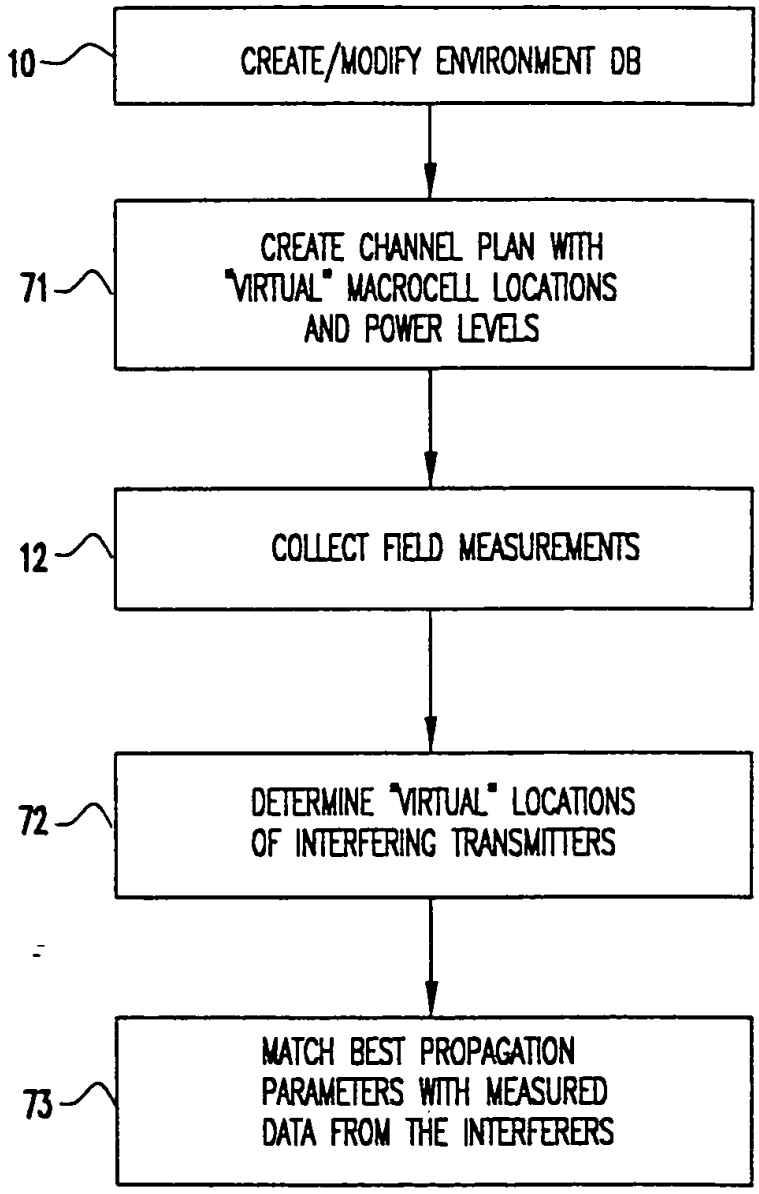
10
CREATE/MODIFY ENVIRONMENT DB
71
CREATE CHANNEL PLAN WITH "VIRTUAL" MACROCELL LOCATIONS AND POWER LEVELS
12
COLLECT FIELD MEASUREMENTS
72
DETERMINE "VIRTUAL" LOCATIONS OF INTERFERING TRANSMITTERS
73
MATCH BEST PROPAGATION PARAMETERS WITH MEASURED DATA FROM THE INTERFERERS

FIG.7

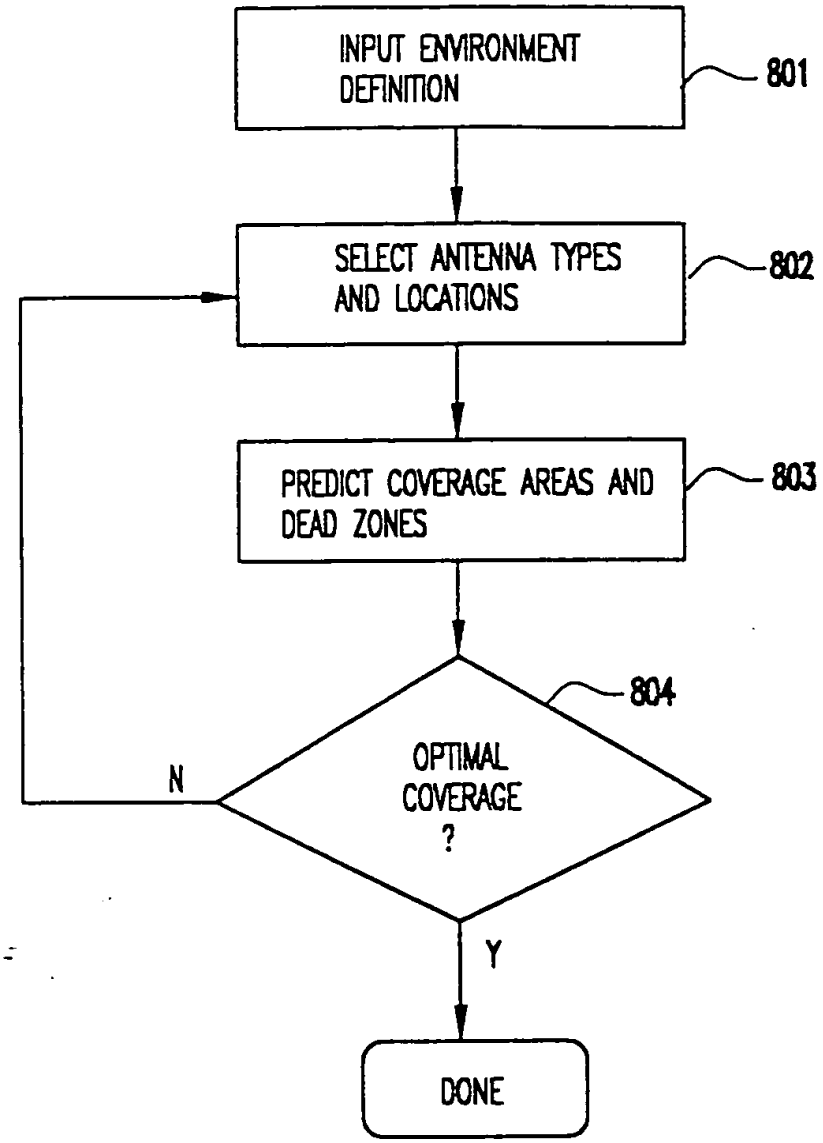
INPUT ENVIRONMENT DEFINITION
801
SELECT ANTENNA TYPES AND LOCATIONS
802
PREDICT COVERAGE AREAS AND DEAD ZONES
803
OPTIMAL COVERAGE ?
804
N
Y
DONE

FIG.8

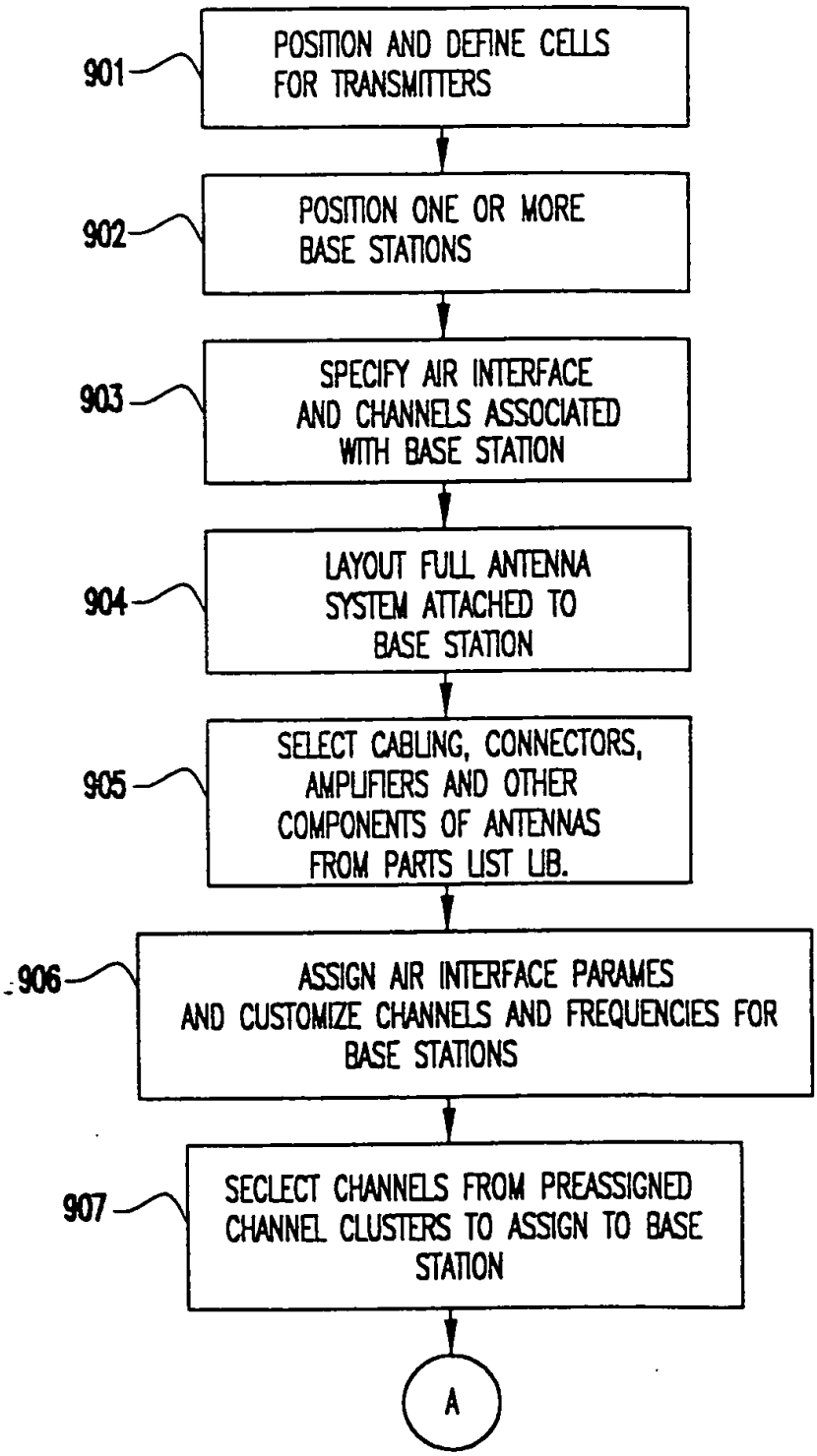
901
POSITION AND DEFINE CELLS FOR TRANSMITTERS
902
POSITION ONE OR MORE BASE STATIONS
903
SPECIFY AIR INTERFACE AND CHANNELS ASSOCIATED WITH BASE STATION
904
LAYOUT FULL ANTENNA SYSTEM ATTACHED TO BASE STATION
905
SELECT CABLING, CONNECTORS, AMPLIFIERS AND OTHER COMPONENTS OF ANTENNAS FROM PARTS LIST LIB.
906
ASSIGN AIR INTERFACE PARAMES AND CUSTOMIZE CHANNELS AND FREQUENCIES FOR BASE STATIONS
907
SECLECT CHANNELS FROM PREASSIGNED CHANNEL CLUSTERS TO ASSIGN TO BASE STATION
A

FIG.9A

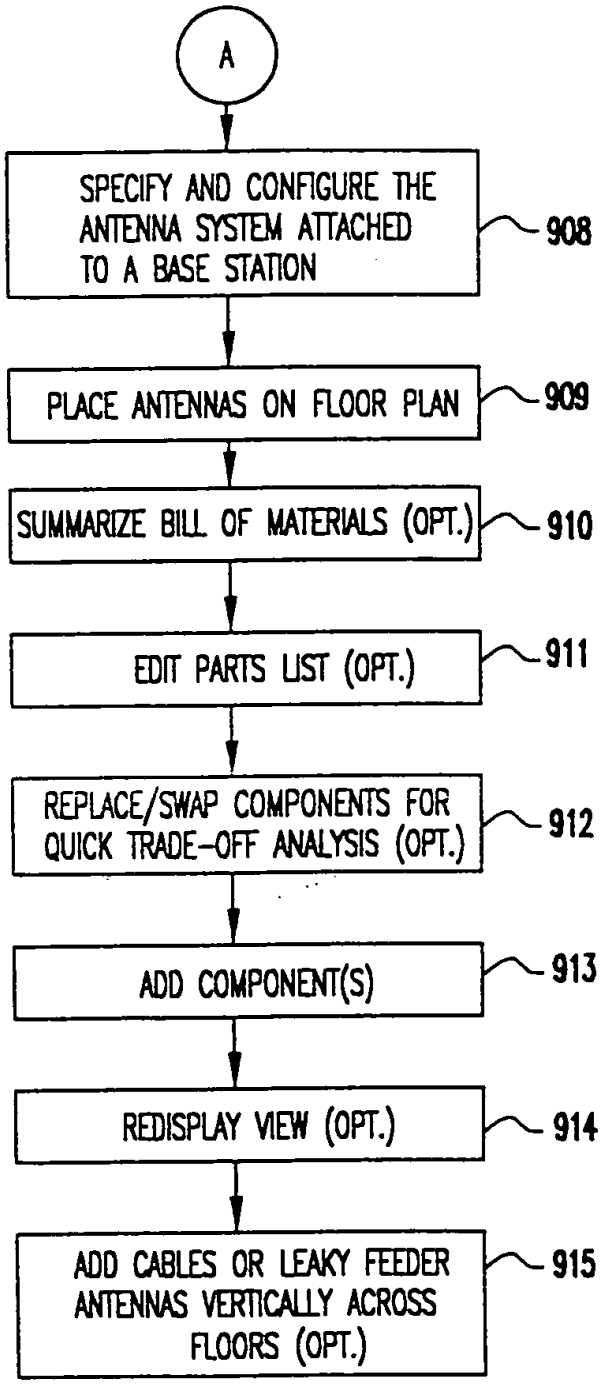
A
SPECIFY AND CONFIGURE THE ANTENNA SYSTEM ATTACHED TO A BASE STATION
908
PLACE ANTENNAS ON FLOOR PLAN
909
SUMMARIZE BILL OF MATERIALS (OPT.)
910
EDIT PARTS LIST (OPT.)
911
REPLACE/SWAP COMPONENTS FOR QUICK TRADE-OFF ANALYSIS (OPT.)
912
ADD COMPONENT(S)
913
REDISPLAY VIEW (OPT.)
914
ADD CABLES OR LEAKY FEEDER ANTENNAS VERTICALLY ACROSS FLOORS (OPT.)
915

FIG.9B

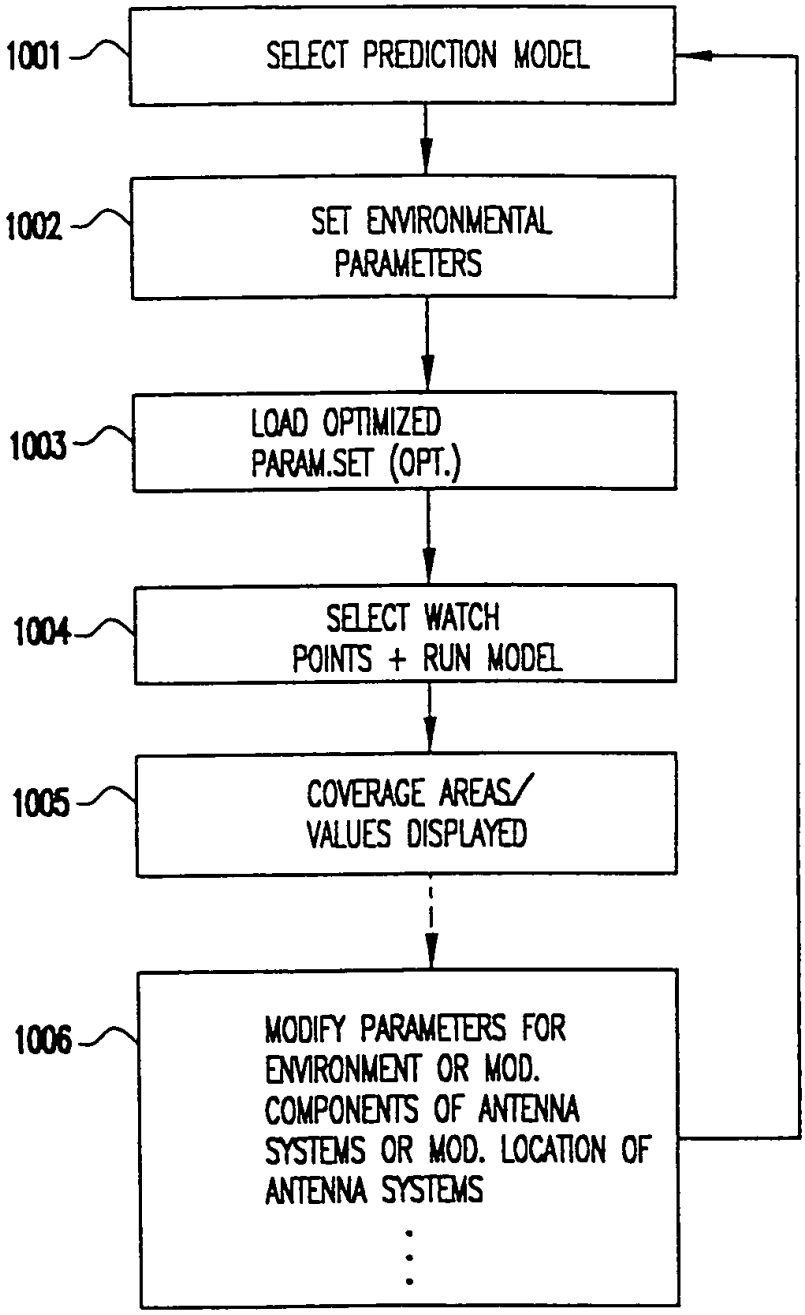
1001
SELECT PREDICTION MODEL
1002
SET ENVIRONMENTAL PARAMETERS
1003
LOAD OPTIMIZED PARAM.SET (OPT.)
1004
SELECT WATCH POINTS + RUN MODEL
1005
COVERAGE AREAS/ VALUES DISPLAYED
1006
MODIFY PARAMETERS FOR ENVIRONMENT OR MOD. COMPONENTS OF ANTENNA SYSTEMS OR MOD. LOCATION OF ANTENNA SYSTEMS

FIG.10

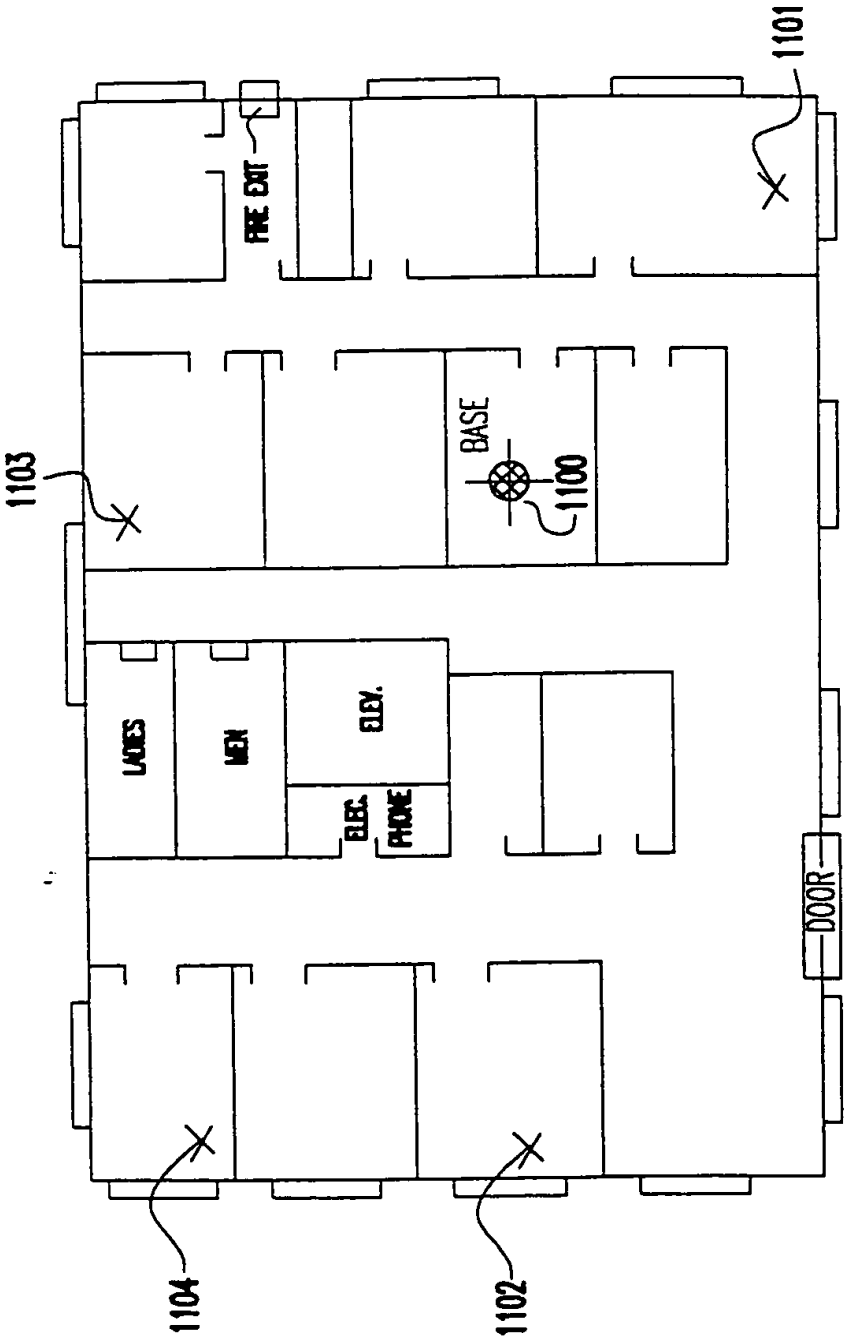
1101
FIRE EXIT
BASE
1100
1103
LADIES
MEN
ELEV.
ELEC.
PHONE
DOOR
1104
1102

FIG.11

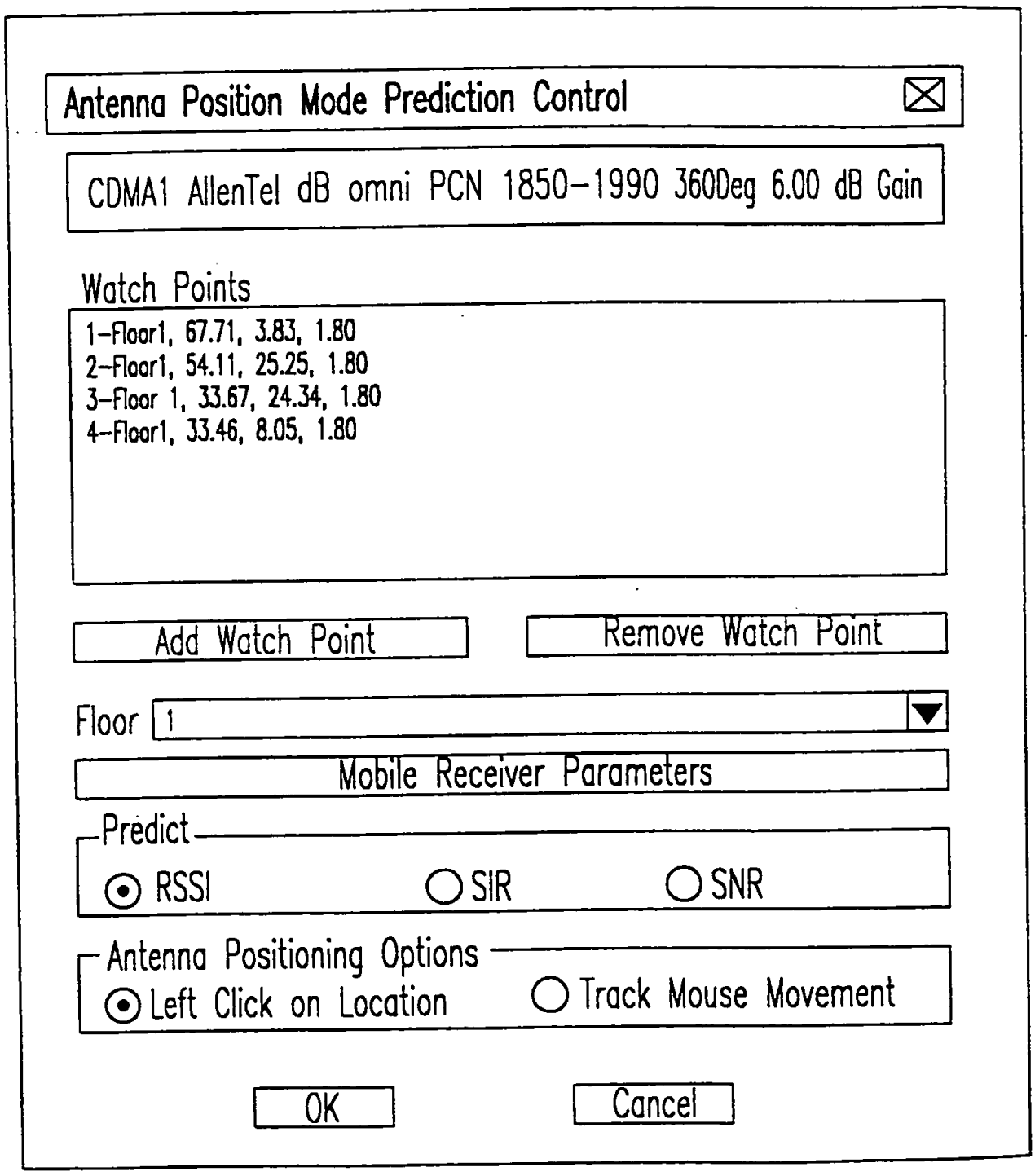
Antenna Position Mode Prediction Control
CDMA1 AllenTel dB omni PCN 1850-1990 360Deg 6.00 dB Gain
Watch Points
1-Floor1, 67.71, 3.83, 1.80
2-Floor1, 54.11, 25.25, 1.80
3-Floor 1, 33.67, 24.34, 1.80
4-Floor1, 33.46, 8.05, 1.80
Add Watch Point
Remove Watch Point
Floor 1
Mobile Receiver Parameters
Predict
RSSI
SIR
SNR
Antenna Positioning Options
Left Click on Location
Track Mouse Movement
OK
Cancel

FIG.12

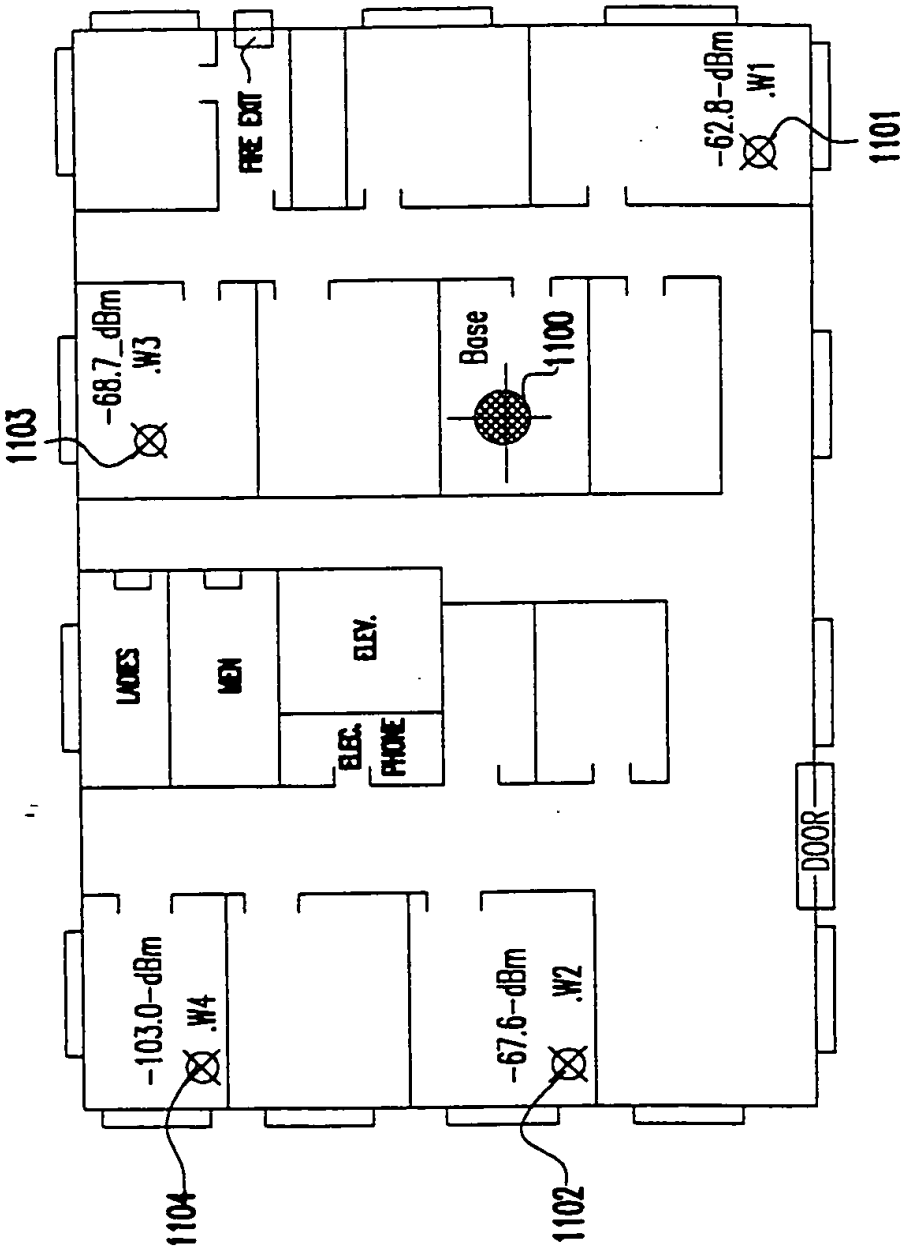
FIRE EXIT
-62.8-dBm
.W1
1101
-68.7_dBm
.W3
1103
Base
1100
LADIES
MEN
ELEV.
ELEC.
PHONE
DOOR
-103.0-dBm
.W4
1104
-67.6-dBm
.W2
1102

FIG.13

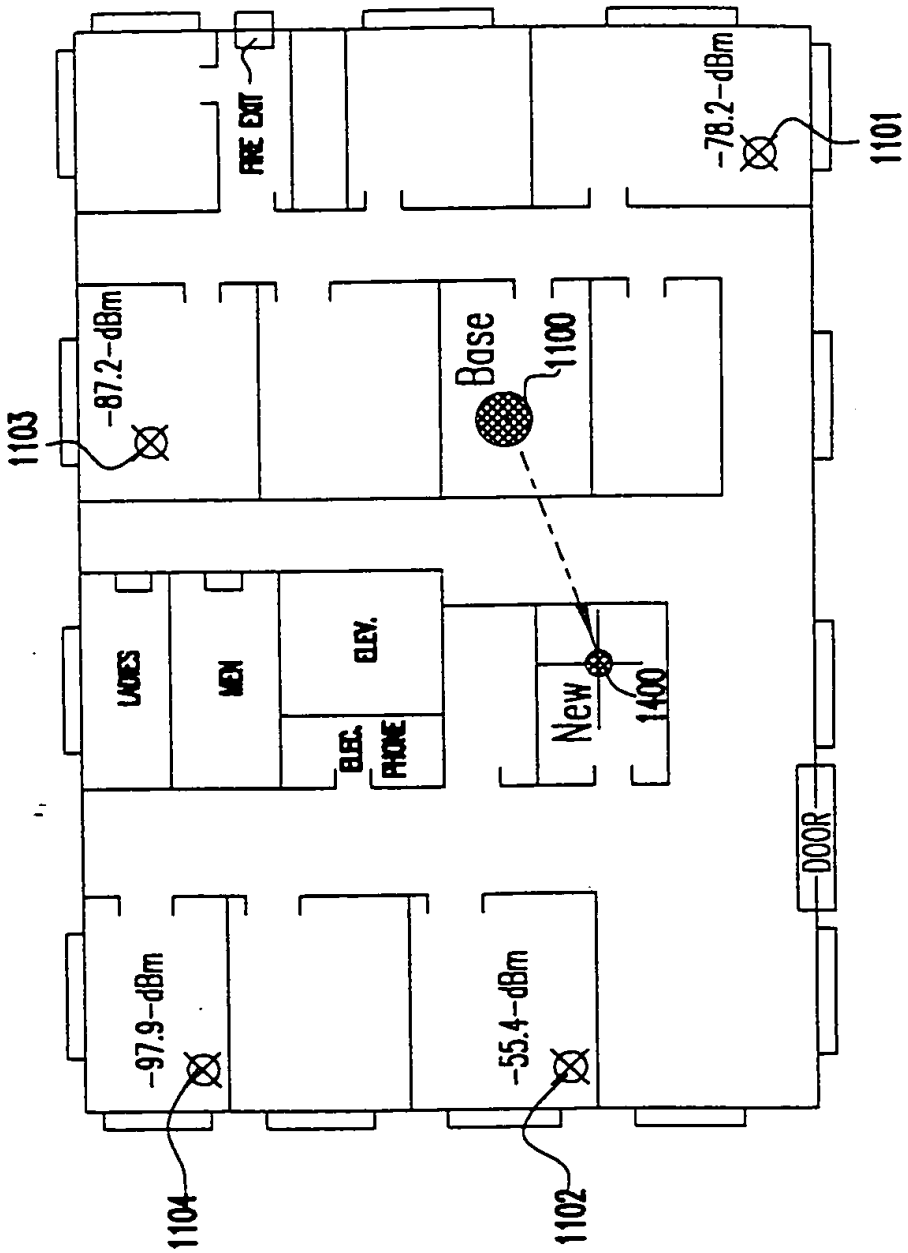
FIRE EXIT
-78.2-dBm
1101
-87.2-dBm
1103
Base
1100
LADIES
MEN
ELEV.
ELEC.
PHONE
New
1400
DOOR
-97.9-dBm
1104
-55.4-dBm
1102

FIG.14

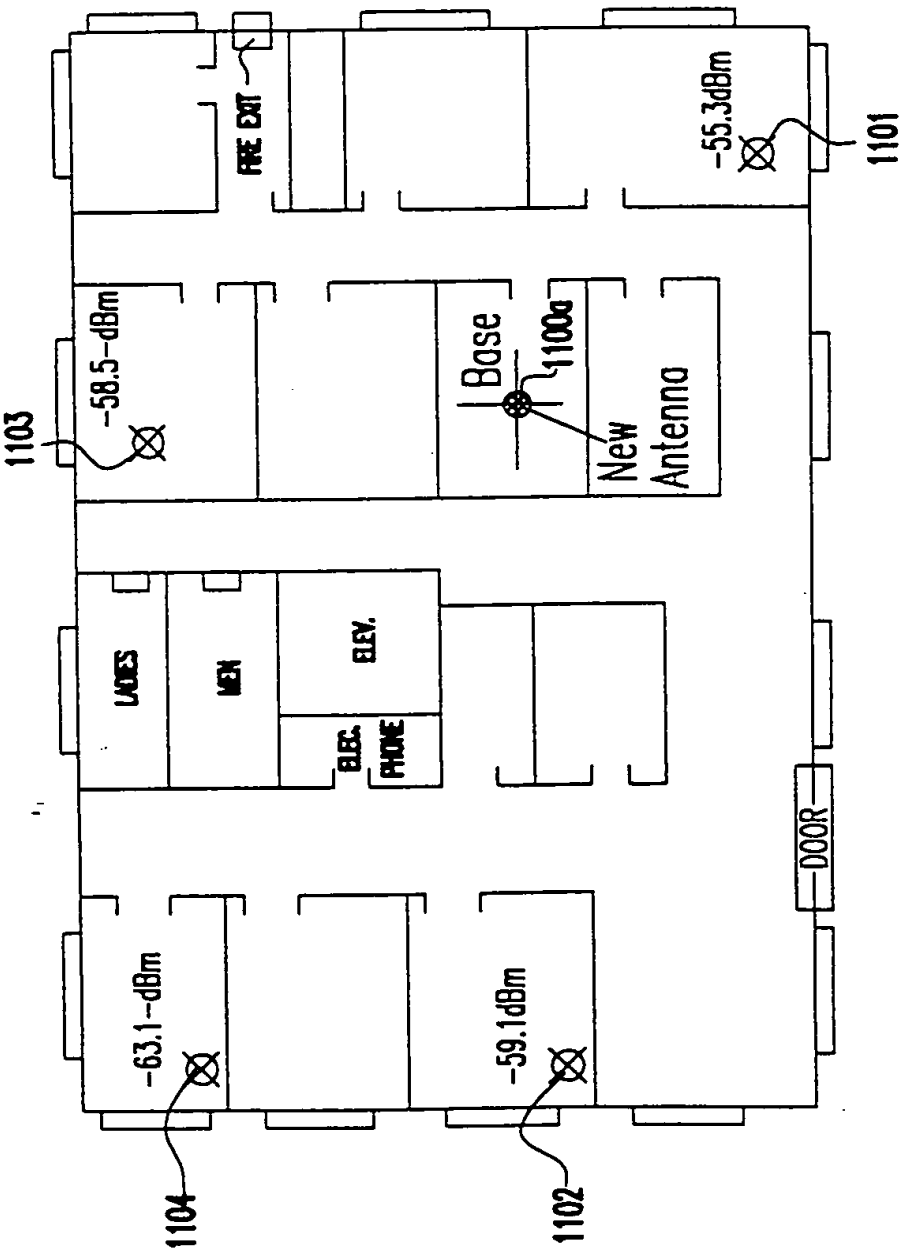
FIRE EXIT
-55.3dBm
1101
-58.5-dBm
1103
Base
1100a
New
Antenna
LADIES
MEN
ELEV.
ELEC.
PHONE
DOOR
-63.1-dBm
-59.1dBm
1104
1102

FIG.15

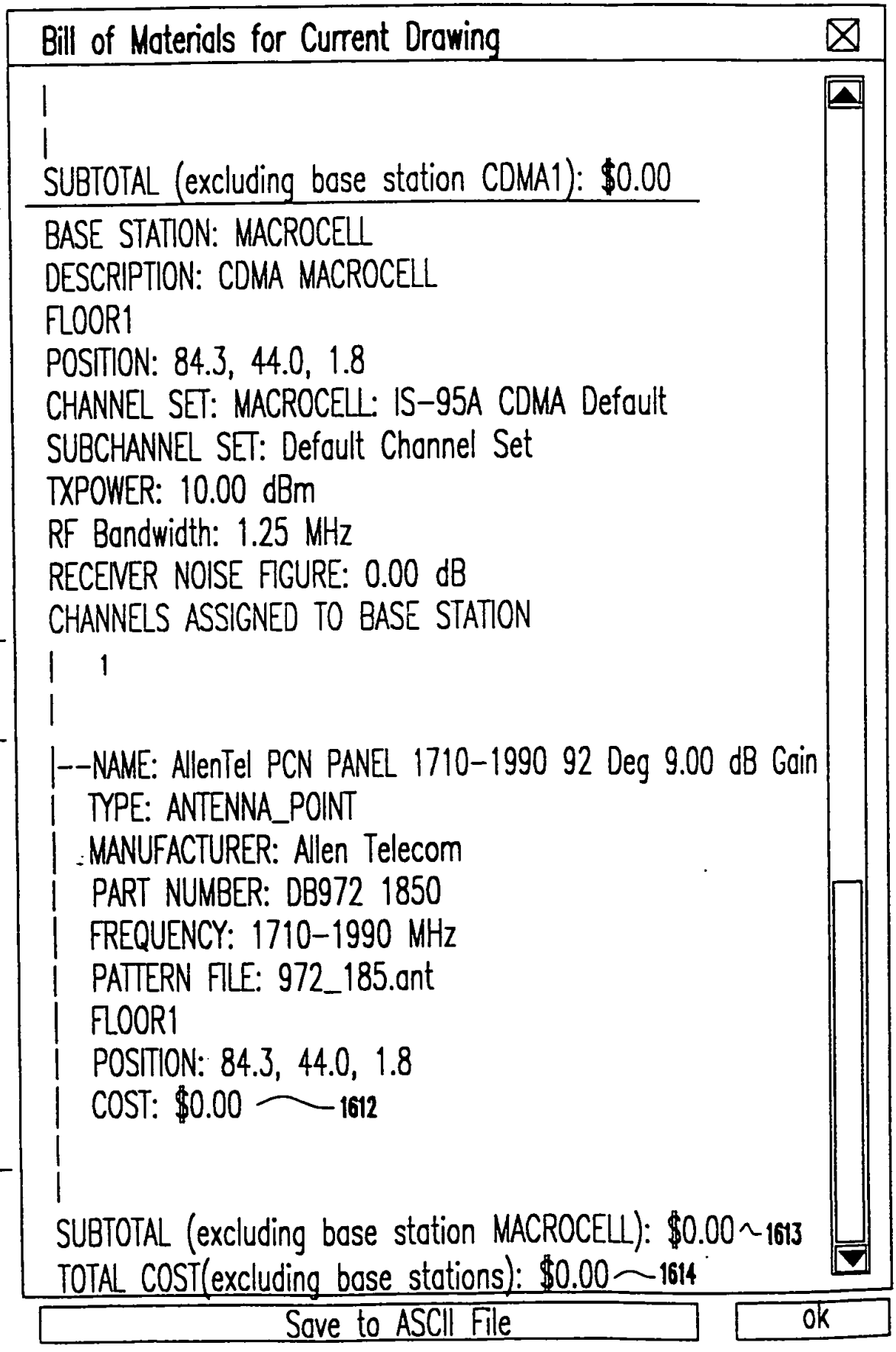
Bill of Materials for Current Drawing
SUBTOTAL (excluding base station CDMA1): $0.00
BASE STATION: MACROCELL
DESCRIPTION: CDMA MACROCELL
FLOOR1
POSITION: 84.3, 44.0, 1.8
CHANNEL SET: MACROCELL: IS-95A CDMA Default
SUBCHANNEL SET: Default Channel Set
TXPOWER: 10.00 dBm
RF Bandwidth: 1.25 MHz
RECEIVER NOISE FIGURE: 0.00 dB
CHANNELS ASSIGNED TO BASE STATION
1
1610
--NAME: AllenTel PCN PANEL 1710-1990 92 Deg 9.00 dB Gain
TYPE: ANTENNA_POINT
MANUFACTURER: Allen Telecom
PART NUMBER: DB972 1850
FREQUENCY: 1710-1990 MHz
PATTERN FILE: 972_185.ant
FLOOR1
POSITION: 84.3, 44.0, 1.8
COST: $0.00
1611
1612
SUBTOTAL (excluding base station MACROCELL): $0.00
1613
TOTAL COST(excluding base stations): $0.00
1614
Save to ASCII File
ok

FIG 16

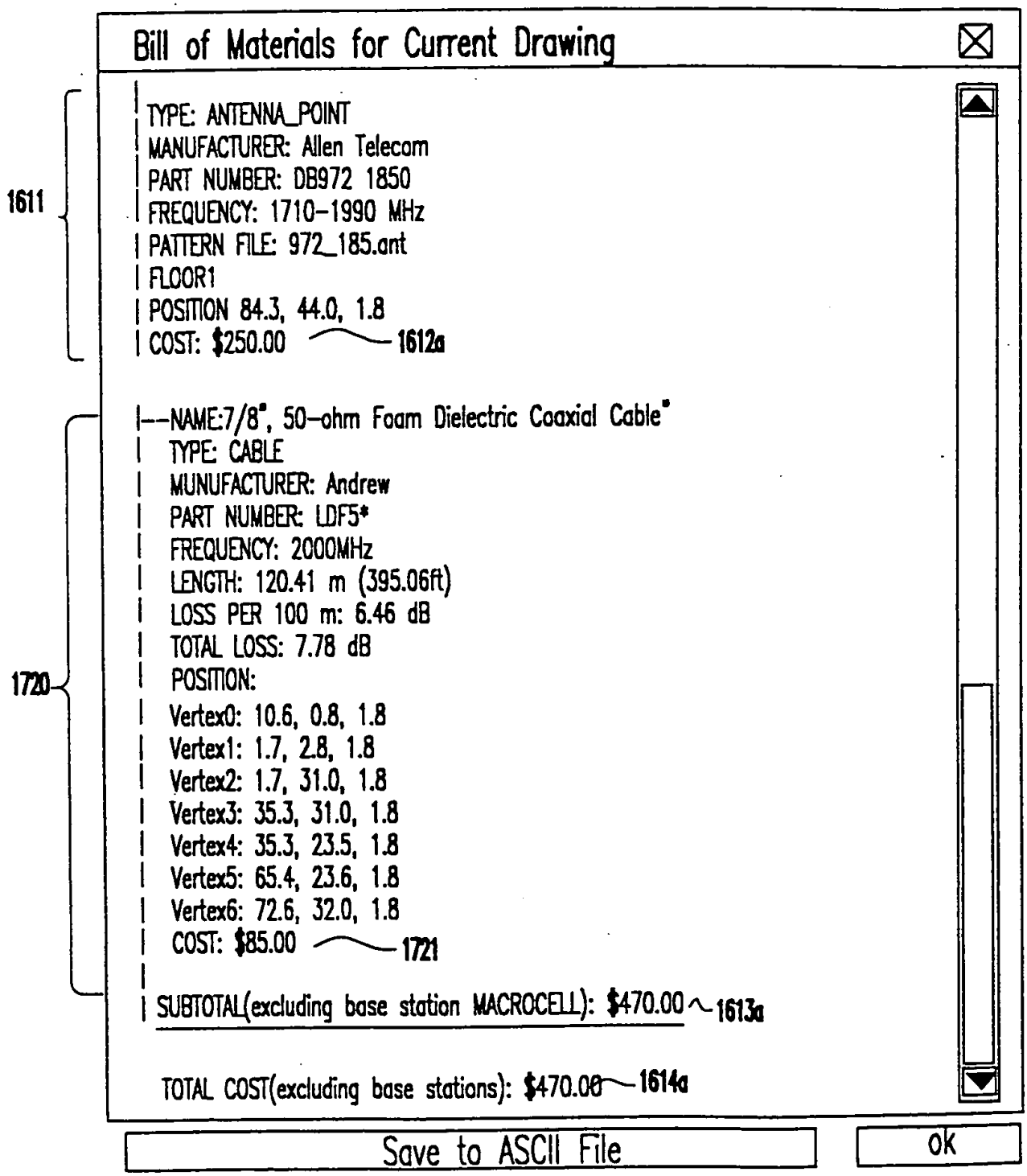
Bill of Materials for Current Drawing
1611
TYPE: ANTENNA_POINT
MANUFACTURER: Allen Telecom
PART NUMBER: DB972 1850
FREQUENCY: 1710-1990 MHz
PATTERN FILE: 972_185.ant
FLOOR1
POSITION 84.3, 44.0, 1.8
COST: $250.00
1612a
1720
--NAME:7/8", 50-ohm Foam Dielectric Coaxial Cable"
TYPE: CABLE
MUNUFACTURER: Andrew
PART NUMBER: LDF5*
FREQUENCY: 2000MHz
LENGTH: 120.41 m (395.06ft)
LOSS PER 100 m: 6.46 dB
TOTAL LOSS: 7.78 dB
POSITION:
Vertex0: 10.6, 0.8, 1.8
Vertex1: 1.7, 2.8, 1.8
Vertex2: 1.7, 31.0, 1.8
Vertex3: 35.3, 31.0, 1.8
Vertex4: 35.3, 23.5, 1.8
Vertex5: 65.4, 23.6, 1.8
Vertex6: 72.6, 32.0, 1.8
COST: $85.00
1721
SUBTOTAL(excluding base station MACROCELL): $470.00
1613a
TOTAL COST(excluding base stations): $470.00
1614a
Save to ASCII File
ok

FIG.17

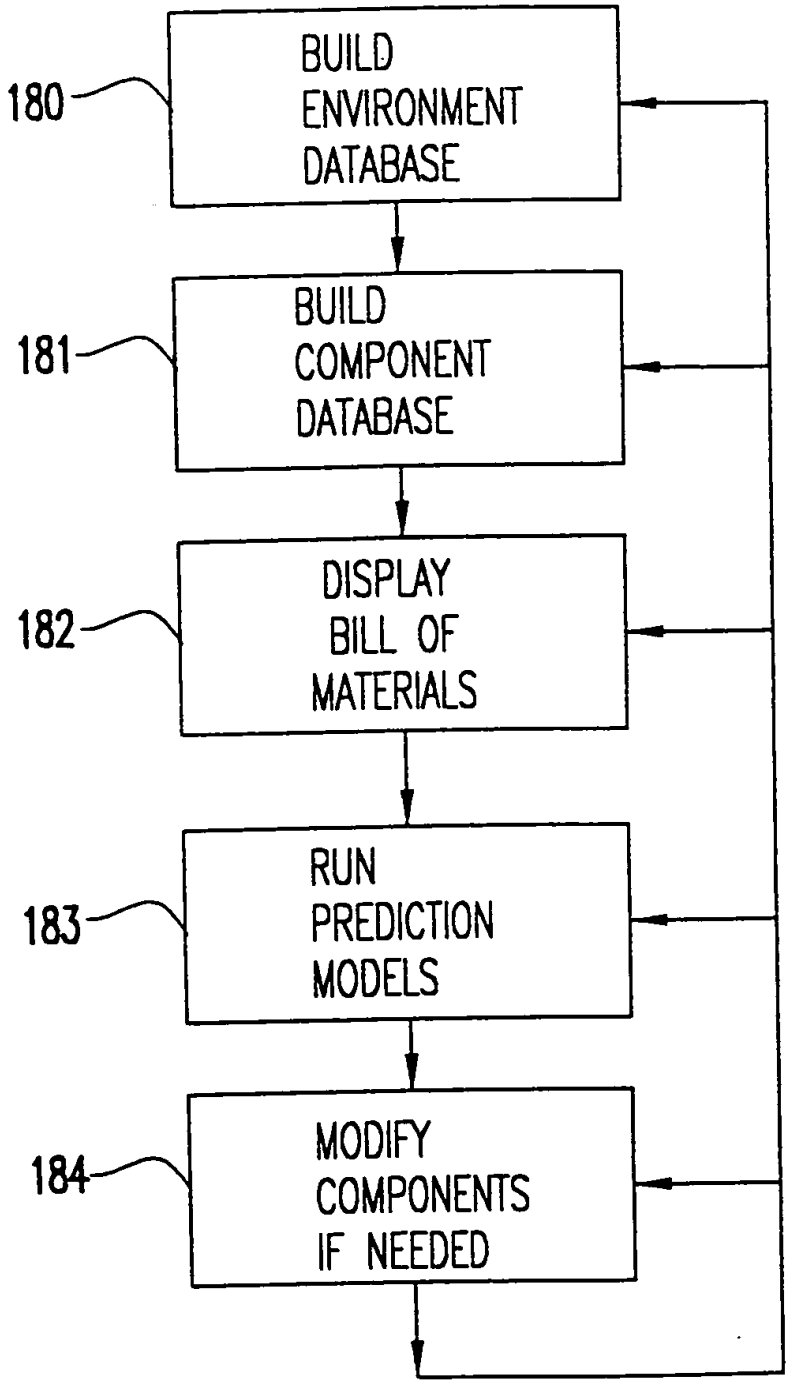
180
BUILD ENVIRONMENT DATABASE
181
BUILD COMPONENT DATABASE
182
DISPLAY BILL OF MATERIALS
183
RUN PREDICTION MODELS
184
MODIFY COMPONENTS IF NEEDED

FIG.18

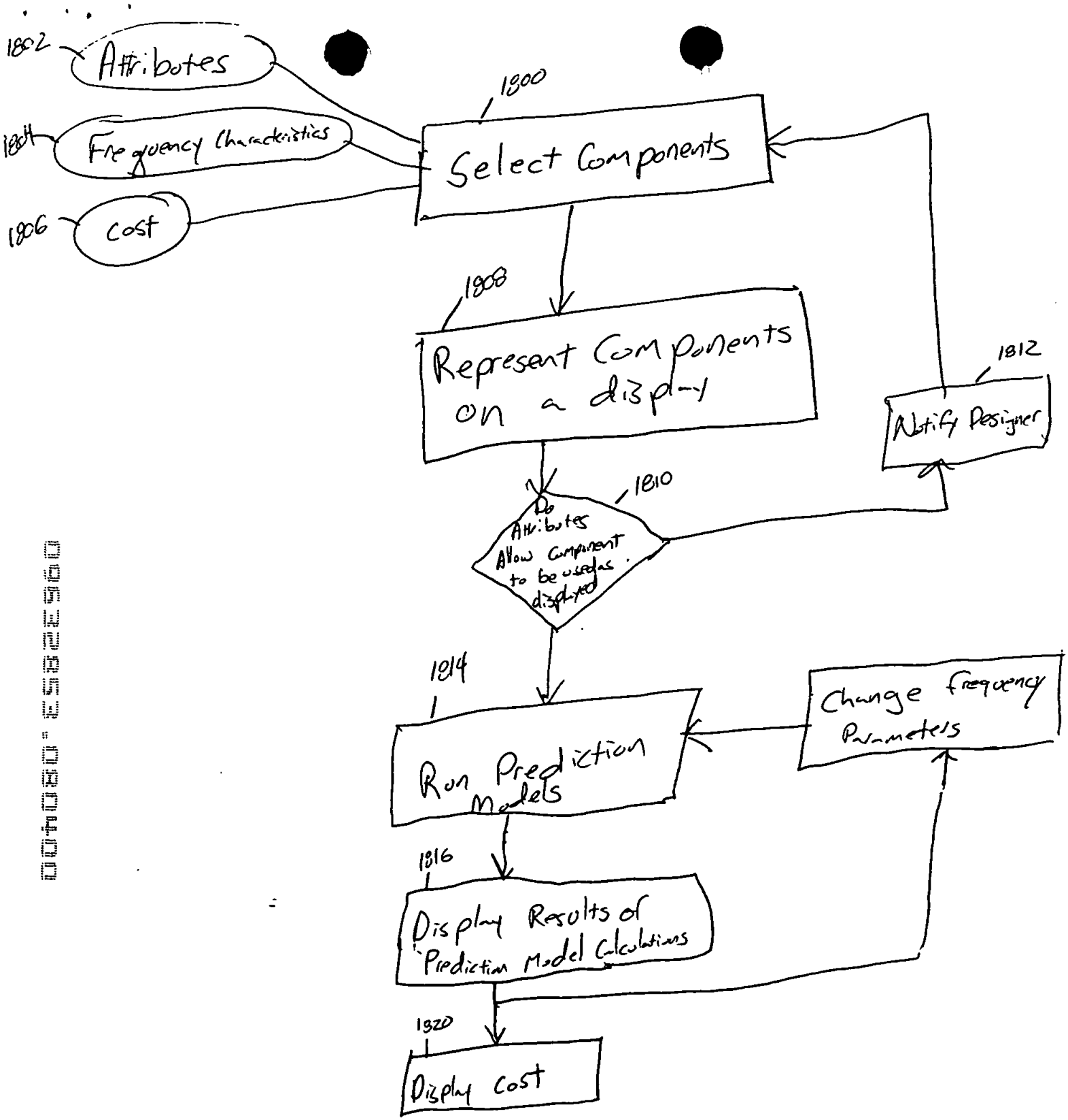
1802
Attributes
1804
Frequency Characteristics
1806
Cost
1800
Select Components
1808
Represent Components on a display
1812
Notify Designer
1810
Do Attributes Allow Component to be used as displayed
1814
Run Prediction Models
Change frequency Parameters
1816
Display Results of Prediction Model Calculations
1320
Display Cost

Figure 19

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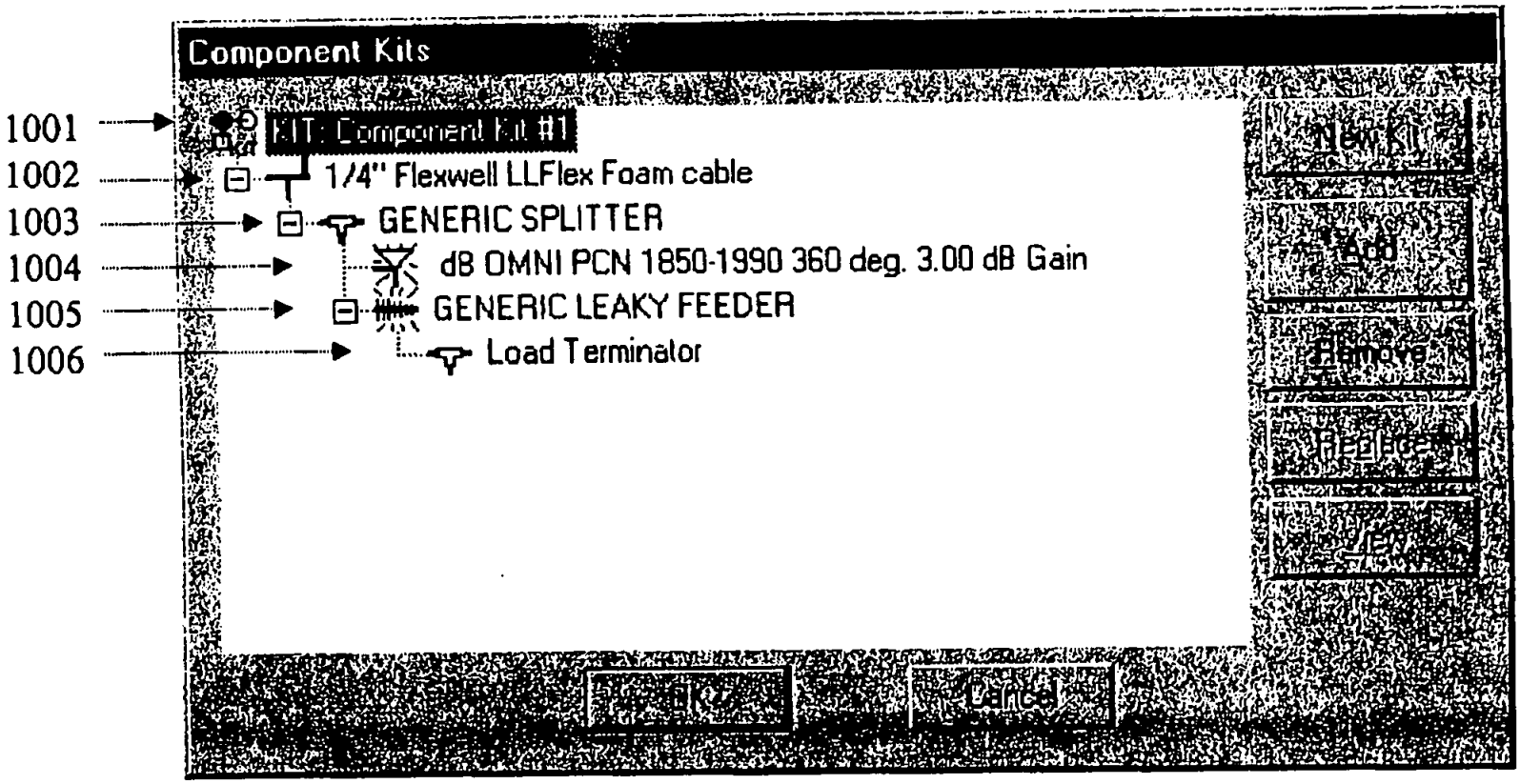

Figure 10

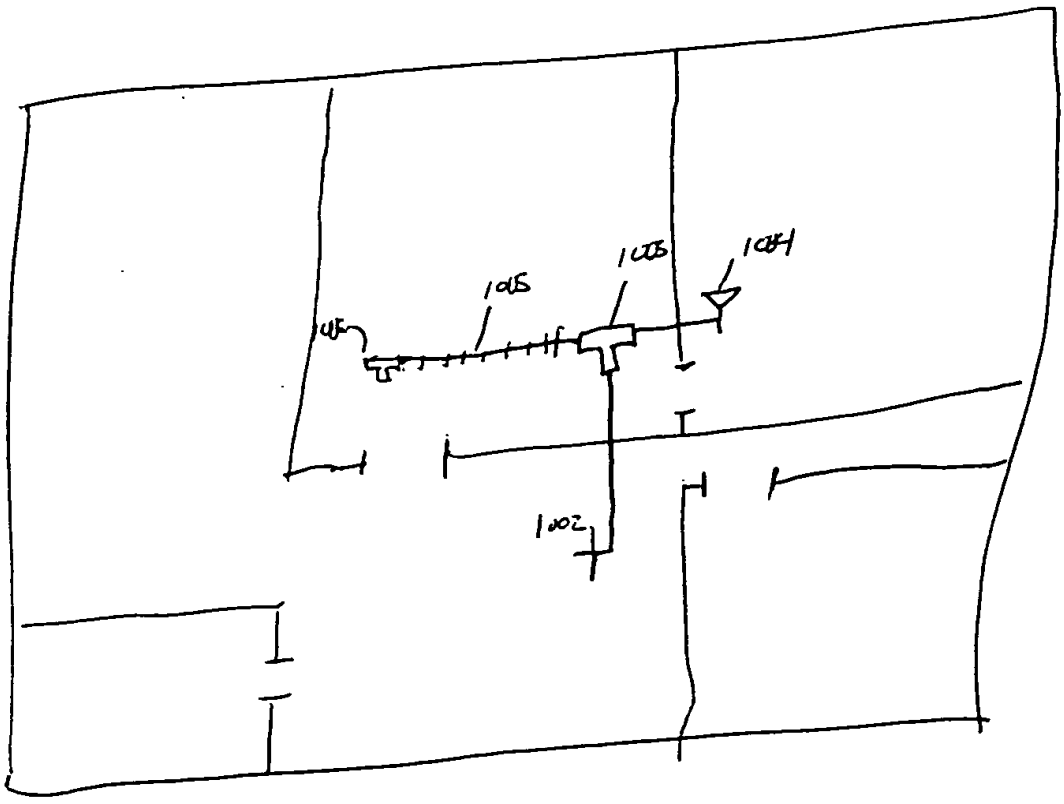

Figure 21